CLAIMS

1   1.   An apparatus for patterning a workpiece arranged at an image plane and covered at least
2   partly with a layer sensitive to electromagnetic radiation, comprising:
3   -   a source emitting electromagnetic radiation onto an object plane,
4   -   an SLM comprising a plurality of on-off object pixels, adapted to receive and
5   modulating said electromagnetic radiation at said object plane in accordance to an
6   input pattern description and to relay said electromagnetic radiation toward said
7   workpiece,
8   -   a synchronizer to synchronize the motion of the workpiece relative to a relayed
9   pattern description from said SLM onto said workpiece, and
10   -   an image-deflecting element arranged between said SLM and said workpiece
11   adapted to deflect said relayed pattern description, wherein at least two pattern
12   descriptions on said SLM are at least partly overlapping on the workpiece.

1   2.   The apparatus according to claim 1, wherein said SLM comprises transmissive pixels.

1   3.   The apparatus according to claim 1, wherein said SLM comprises reflective pixels.

1   4.   The apparatus according to claim 3, wherein said reflective pixels are micromirrors.

1   5.   The apparatus according to claim 1, wherein said synchronization is performed to cause
2   said relayed pattern description to impinge on a fixed area of said workpiece for an
3   extended period of time.

1   6.   The apparatus according to claim 1, wherein radiation from said electromagnetic
2   radiation source is prevented from impinging onto said workpiece while reloading said
3   SLM with a new pattern description.

1   7.   The apparatus according to claim 6, wherein said radiation is deflected in order to be
2   prevented from impinging onto said workpiece.

1   8. The apparatus according to claim 6, wherein said radiation is blocked in order to be
2   prevented from impinging onto said workpiece.

1   9. The apparatus according to claim 6, wherein said radiation source is switched off in order
2   to prevent said radiation from impinging onto said workpiece.

1   10. The apparatus according to claim 1, wherein successive pattern descriptions on said SLM
2   are imaged onto said workpiece adjacent to each other.

1   11. The apparatus according to claim 1, wherein the modulation crates a coherent sub-image
2   on the workpiece and several sub-images are non-coherently superposed to create a final
3   image.

1   12. The apparatus according to claim 10, wherein successive pattern descriptions on said
2   SLM are non-overlapping on said workpiece.

1   13. The apparatus according to claim 1, wherein successive pattern descriptions on said SLM
2   are imaged onto said workpiece non-adjacent to each other.

1   14. The apparatus according to claim 1, wherein said image deflecting element is a rotating
2   prism.

1   15. The apparatus according to claim 1, wherein said image deflecting element is a rotating
2   reflective polygon.

1   16. The apparatus according to claim 15, wherein said rotating reflective polygon comprises
2   at least three reflecting surfaces.

1   17. The apparatus according to claim 1, wherein said pattern description on said SLM is
2   changed while deflecting said relayed pattern description onto the workpiece.

1   18. A method for patterning a workpiece arranged at an image plane and covered at least
2   partly with a layer sensitive to electromagnetic radiation, comprising the actions of:

3   -   emitting electromagnetic radiation onto an object plane,

4   -   receiving and modulating said electromagnetic radiation at said object plane in

5   accordance to an input pattern description by an SLM comprising a plurality of on-

6   off object pixels,

7   -   relaying said electromagnetic radiation toward said workpiece,

8   -   deflecting a relayed pattern description from said SLM onto said workpiece,

9   -   synchronizing the motion of the workpiece relative to said relayed pattern

10   description from said SLM onto said workpiece, wherein at least two pattern

11   descriptions on said SLM are at least partly overlapping on the workpiece.

1   19. The method according to claim 18, wherein said SLM comprises transmissive pixels.

1   20. The method according to claim 18, wherein said SLM comprises reflective pixels.

1   21. The method according to claim 20, wherein said reflective pixels are micromirrors.

1   22. The method according to claim 18, wherein said synchronizing is performed to cause

2   said relayed pattern description from said SLM to impinge on a fixed area of said

3   workpiece for an extended period of time.

1   23 The method according to claim 18, further comprising the action of

2   -   preventing said radiation from said electromagnetic radiation source from impinging

3   onto said workpiece while reloading said SLM with a new pattern description.

1   24 The method according to claim 23, wherein said radiation is deflected in order to be

2   prevented from impinging onto said workpiece.

1   25 The method according to claim 23, wherein said radiation is blocked in order to be

2   prevented from impinging onto said workpiece.

1   26. The method according to claim 23, wherein said radiation source is switched off in order

2   to prevent said radiation from impinging onto said workpiece.

1 27. The method according to claim 18, further comprising the action of:

2   -   imaging successive pattern descriptions onto said workpiece adjacent to each other.

1 28. The method according to claim 27, where the modulation creates a coherent sub-image

2   on the workpiece and several sub-images are non-coherently superposed to create a final

3   image.

1 29. The method according to claim 27, wherein successive pattern descriptions are non-

2   overlapping on said workpiece.

1 30 The method according to claim 18, further comprising the action of:

2   -   imaging successive pattern descriptions onto said workpiece non-adjacent to each

3   other.

1 31. The method according to claim 18, wherein said image deflecting element is a rotating

2   prism.

1 32. The method according to claim 18 wherein said image deflecting element is a rotating

2   reflective polygon.

1 33. The method according to claim 32, wherein said rotating reflective polygon comprises at

2   least three reflecting surfaces.

1 34. The method according to claim 18, further comprising the action of:

2   -   performing greyscale printing by time multiplexing the object pixels.

1 35. The method according to claim 18, wherein said synchronization is performed to write

2   stamps onto said workpiece corresponding to pattern descriptions on said SLM, where

3   said stamps defining sub-images together form a complete pattern.

1 36. The method according to claim 18, further comprising the action of:

2   -   changing said pattern description on said SLM while deflecting said relayed pattern

3   description onto the workpiece.

1   37. A workpiece arranged at an image plane and covered with a layer sensitive to
2   electromagnetic radiation, wherein said layer is illuminated by electromagnetic radiation
3   relayed from an SLM, arranged at an object plane and comprising a plurality of on-off
4   object pixels, adapted to receive and modulating said electromagnetic radiation at said
5   object plane in accordance to an input pattern description, a motion of said workpiece is
6   synchronized with said relayed pattern description from said computer-controlled reticle
7   onto said workpiece, said relayed pattern description is deflected by an image deflecting
8   element arranged between said SLM and said workpiece, wherein at least two pattern
9   descriptions on said SLM are at least partly overlapping on the workpiece.

1   38. The workpiece according to claim 37, wherein said workpiece is a reticle or a mask.

1   39. The workpiece according to claim 37, wherein said workpiece is a semiconducting wafer.

1   40. A method to form an image comprising the actions of:
2   -   providing a laser source,
3   -   scanning at least one beam from said laser source over a workpiece,
4   -   modulating said at least one beam during scanning according to an input pattern data
5   file, where said modulation of the beam creates a coherent sub-image on the
6   workpiece and several sub-images are non-coherently superposed to create a final
7   image.

1   41. The method according to claim 40, further comprising the action of:
2   -   destroying the interference between individual beams before impinging onto the
3   SLM.

1   42. The method according to claim 41, wherein said interference between individual beams
2   are destroyed by means of adding or subtracting a shift in frequency.

1   43. The method according to claim 41, wherein said interference between individual beams
2   are destroyed by means of adding or subtracting a portion of path length.

1   44. The method according to claim 40, wherein said at least one beam is modulated by
2   means of an acousto-optic cell comprising an array of transducers.

1   45. The method according to claim 40, wherein said transducers are driven by a RF wave
2   multiplied by an analogue signal. .

1   46. The method according to claim 40, wherein said at least one beam is modulated by
2   means of an SLM comprising a plurality of on-off pixels.

1   47. A method for forming an image onto a workpiece, comprising the actions of:
2   -   providing an electromagnetic radiation source,
3   -   scanning at least one beam from said source over at least a portion of a spatial light
4   modulator,
5   -   modulating said at least one beam according to an input pattern data file, where said
6   modulation of the at least one beam creates a coherent sub-image on the workpiece
7   and several sub-images are non-coherently superposed to create a final image.

1   48. The method according to claim 47, further comprising the action of:
2   -   reloading a new pattern description on at least one portion of said modulator while
3   scanning a different portion of said modulator by said at least one beam.

1   49. The method according to claim 47, wherein said SLM comprising a plurality of on-off
2   pixels.

1   50. An apparatus for forming a pattern on a radiation sensitive material comprising:
2   -   a source to form a radiation beam,
3   -   a scanning element to scan at least one beam from said radiation source over said
4   radiation sensitive material,
5   -   a modulator to modulate said at least one beam during scanning according to an
6   input pattern data file, where said modulation of the beam creates a coherent sub-
7   image on the workpiece and several sub-images are non-coherently superposed to
8   create a final image.

1   51.   The apparatus according to claim 50, further comprising an element to destroy the

2   interference between individual beams before impinging onto the SLM.

1   52.   The apparatus according to claim 51, wherein the interference is destroyed by an

2   element, which adds or subtracts a shift in frequency unequal for interferable beams.

1   53.   The apparatus according to claim 51, wherein the interference is destroyed by an

2   element, which adds or subtracts a unequal portion of optical path-length for interferable

3   beams.

1   54.   The apparatus according to claim 51, wherein said modulator is an acousto-optic cell

2   comprising an array of transducers.

1   55.   The apparatus according to claim 54, wherein said transducers are driven by a RF wave

2   multiplied by an analogue signal.

1   56.   An apparatus for forming a pattern on a radiation sensitive material comprising:

2   -   a source to form a radiation beam,

3   -   a scanning element to scan at least one beam from said radiation source over a

4   spatial light modulator,

5   -   a modulator to modulate said at least one beam according to an input pattern data

6   file, where said modulation of the beam creates a coherent sub-image on the

7   workpiece and several sub-images are non-coherently superposed to create a final

8   image.

1   57.   The apparatus according to claim 56, where a new pattern description is reloaded on at

2   least one portion of said modulator while scanning a different portion of said modulator

3   by said at least one beam.

1   58.   An apparatus for patterning a workpiece arranged at an image plane and covered at least

2   partly with a layer sensitive to electromagnetic radiation, comprising

3   -   a source emitting electromagnetic radiation onto an object plane,

4   -   a modulator comprising a plurality of modulating elements, adapted to receive and

5   modulating said electromagnetic radiation at said object plane in accordance to an

6   input pattern description and to relay said electromagnetic radiation toward said

7   workpiece,

8   -   a synchronizer to synchronize the motion of the workpiece relative to a relayed

9   pattern description from said SLM onto said workpiece and a loading of said input

10   pattern description, and

11   -   an image-deflecting element adapted to deflect said relayed pattern description on

12   the workpiece, wherein at least two pattern descriptions on said SLM are at least

13   partly overlapping on the workpiece.

1   59.   A method for patterning a workpiece arranged at an image plane and covered at least

2   partly with a layer sensitive to electromagnetic radiation, comprising the actions of:

3   -   emitting electromagnetic radiation onto an object plane,

4   -   receiving and modulating said electromagnetic radiation at said object plane in

5   accordance to an input pattern description by a modulator comprising a plurality of

6   modulating elements,

7   -   relaying said electromagnetic radiation toward said workpiece,

8   -   deflecting a relayed pattern description from said modulator onto said workpiece,

9   -   synchronizing the motion of the workpiece relative to a relayed pattern description

10   from said modulator onto said workpiece and a loading of said input pattern

11   description, wherein at least two pattern descriptions on said SLM are at least partly

12   overlapping on the workpiece.